

Smart High-Side Power Switch

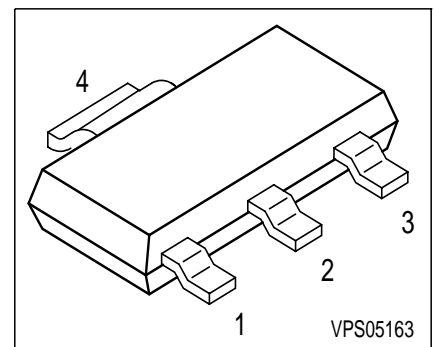
One Channel: 1 x 1 Ω

Features

- Current controlled input
- Short circuit protection
- Current limitation
- Overload protection
- Overvoltage protection (including load dump)
- Switching inductive loads
- Clamp of negative voltage at output with inductive loads
- Thermal shutdown with restart
- ESD - Protection
- Loss of GND and loss of V_{bb} protection
- Reverse battery protection

Product Summary

| | | | |
|------------------------|----------------|----------|----------|
| Overvoltage protection | $V_{bbin(AZ)}$ | 65 | V |
| Operating voltage | $V_{bb(on)}$ | 4.9...60 | V |
| On-state resistance | R_{ON} | 1 | Ω |



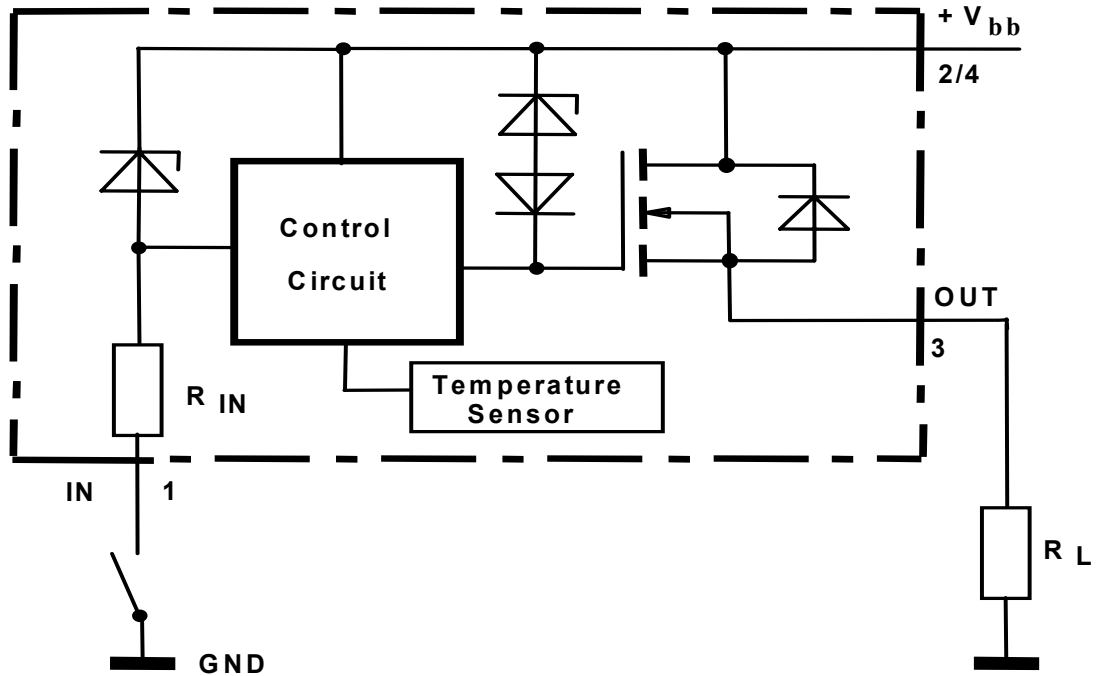
Application

- All types of resistive, inductive and capacitive loads
- Current controlled power switch for 12 V, 24 V and 42 V DC applications
- Driver for electromechanical relays
- Signal amplifier

General Description

N channel vertical power MOSFET with charge pump and current controlled input, monolithically integrated in Smart SIPMOS[®] technology. Fully protected by embedded protection functions.

Block Diagram



| Pin | Symbol | Function |
|-----|--------|--|
| 1 | IN | Input, activates the power switch in case of connection to GND |
| 2 | Vbb | Positive power supply voltage |
| 3 | OUT | Output to the load |
| 4 | Vbb | Positive power supply voltage |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|--|----------------|--------------|------|
| at $T_j = 25^\circ\text{C}$, unless otherwise specified | | | |
| Supply voltage | V_{bb} | 65 | V |
| Load current (Short - circuit current, see page 5) | I_L | self limited | A |
| Maximum current through the input pin (DC) | I_{IN} | ± 15 | mA |
| Operating temperature | T_j | -40 ... +150 | °C |
| Storage temperature | T_{stg} | -55 ... +150 | |
| Power dissipation ¹⁾ $T_A = 25^\circ\text{C}$ | P_{tot} | 1.7 | W |
| Inductive load switch-off energy dissipation ¹⁾²⁾ single pulse $T_j = 150^\circ\text{C}$, $I_L = \text{tbd A}$ | E_{AS} | >5 | mJ |
| Load dump protection $V_{LoadDump}^{3)} = V_A + V_S$ $t_d = 400 \text{ ms}$, $R_I = 2 \Omega$, $R_L = \text{tbd } \Omega$ | $V_{Loaddump}$ | tbd | V |
| Electrostatic discharge voltage (Human Body Model) according to ANSI EOS/ESD - S5.1 - 1993 ESD STM5.1 - 1998 | V_{ESD} | | kV |
| Input pin | | ± 1 | |
| all other pins | | ± 5 | |

¹Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6 cm² (one layer, 70µm thick) copper area for V_{bb} connection. PCB is vertical without blown air.

²not tested, specified by design

³ $V_{Loaddump}$ is setup without the DUT connected to the generator per ISO 7637-1 and DIN 40839

Electrical Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|--------|--------|------|------|------|
| | | min. | typ. | max. | |
| at $T_j = 25\text{ }^\circ\text{C}$, $V_{bb} = 24\text{ V}$ unless otherwise specified | | | | | |

Thermal Characteristics

| | | | | | |
|---|--------------|---|---|-----|-----|
| Thermal resistance @ min. footprint | $R_{th(JA)}$ | - | - | 125 | K/W |
| Thermal resistance @ 6 cm ² cooling area ¹⁾ | $R_{th(JA)}$ | - | - | 70 | |
| Thermal resistance, junction - soldering point | $R_{th(JS)}$ | - | - | 17 | K/W |

Load Switching Capabilities and Characteristics

| | | | | | |
|--|----------------|-----|-----|-----|------------------|
| On-state resistance $T_j = 25\text{ }^\circ\text{C}$, Pin1 connected to GND $T_j = 150\text{ }^\circ\text{C}$ | R_{ON} | - | 1 | - | Ω |
| | | - | 1.5 | - | |
| Nominal load current Device on PCB ¹⁾ | $I_{L(nom)}$ | >70 | - | - | mA |
| Turn-on time to 90% V_{OUT} $V_{IN} = 0$ to 10 V | t_{on} | - | 80 | tbd | μs |
| Turn-off time to 10% V_{OUT} $V_{IN} = 10$ to 0 V | t_{off} | - | 80 | tbd | |
| Slew rate on 10 to 30% V_{OUT} , | dV/dt_{on} | - | 4 | tbd | V/ μs |
| Slew rate off 70 to 40% V_{OUT} , | $-dV/dt_{off}$ | - | 4 | tbd | |

¹Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for V_{bb} connection. PCB is vertical without blown air.

Electrical Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|--------|--------|------|------|------|
| | | min. | typ. | max. | |
| at $T_j = 25\text{ °C}$, $V_{bb} = 24\text{ V}$ unless otherwise specified | | | | | |

Operating Parameters

| | | | | | |
|--|---------------|-----|---|----|---------------|
| Operating voltage $T_j = -40...150\text{ °C}$ | $V_{bb(on)}$ | 4.9 | - | 60 | V |
| Standby current $T_j = -40...150\text{ °C}$, Pin1 = open | $I_{bb(off)}$ | - | - | 10 | μA |

Protection Functions

| | | | | | |
|--|-----------------|---------------|---------------|---------------|-------------|
| Initial peak short circuit current limit $T_j = -40\text{ °C}$ $T_j = 25\text{ °C}$ $T_j = 150\text{ °C}$ | $I_{L(SCp)}$ | - - 0.2 | - 0.5 - | tbd - - | A |
| Repetitive short circuit current limit $T_j = T_{jt}$ (see timing diagrams) | $I_{L(SCr)}$ | - | tbd | - | |
| Output clamp (inductive load switch off) at $V_{OUT} = V_{bb} - V_{ON(CL)}$, | $V_{ON(CL)}$ | 65 | - | - | V |
| Overvoltage protection ¹⁾ $T_j = -40...150\text{ °C}$ | $V_{bbin(AZ)}$ | 65 | 72 | - | |
| Thermal overload trip temperature | T_{jt} | 150 | - | - | °C |
| Thermal hysteresis | ΔT_{jt} | - | 10 | - | K |

¹see also $V_{ON(CL)}$ in circuit diagram

Electrical Characteristics

| Parameter at $T_j = 25\text{ °C}$, $V_{bb} = 24\text{ V}$ unless otherwise specified | Symbol | Values | | | Unit |
|--|--------|--------|------|------|------|
| | | min. | typ. | max. | |

Input

| | | | | | |
|--|---------------|---|-----|------|------------|
| Off state input current $T_j = -40\text{...}150\text{ °C}$ | $I_{IN(off)}$ | - | - | 0.05 | mA |
| On state input current (Pin1 grounded) ¹⁾ $T_j = -40\text{...}150\text{ °C}$ | $I_{IN(on)}$ | - | 0.3 | 1 | |
| Input resistance | R_I | - | 1 | - | k Ω |

Reverse Battery

| | | | | | |
|--|-----------|---|-----|-----|----|
| Continuous reverse drain current $T_C = 25\text{ °C}$ | I_S | - | - | 0.2 | A |
| Drain-source diode voltage | $-V_{ON}$ | - | 600 | - | mV |

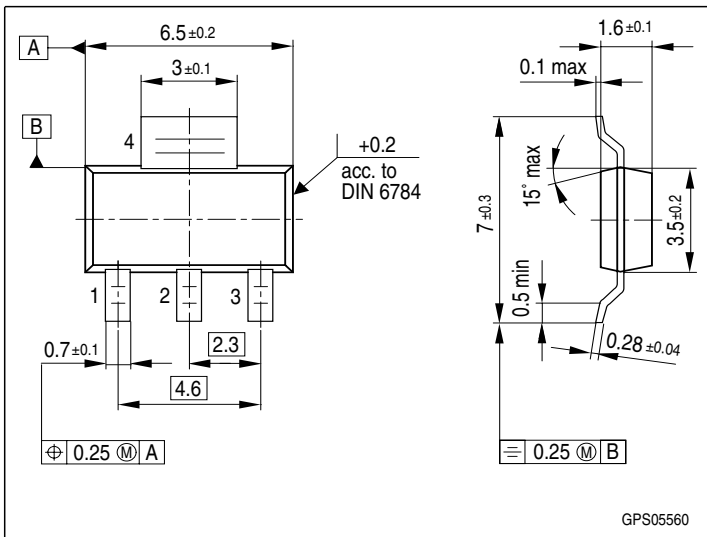
¹Driver circuit must be able to drive currents > 1mA.

Package and ordering code

all dimensions in mm

Ordering code:

| | |
|--|---|
| | - |
|--|---|



Published by
Infineon Technologies AG,
Bereichs Kommunikation
St.-Martin-Strasse 53,
D-81541 München
© Infineon Technologies AG 1999
All Rights Reserved.

Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Infineon Technologies is an approved CECC manufacturer.

Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office in Germany or our Infineon Technologies Representatives worldwide (see address list).

Warnings

Due to technical requirements components may contain dangerous substances.

For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.